angle of the recording light used to form the optical element and a polarization angle of the reproducing light before the reproducing light is acted on by the optical element; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

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REMARKS

Claims 1-55 are pending in this application. By this Amendment, claims 1, 11, 21, 22, 26, 35, 37, 39, 40, 43, 46, 49 and 52-55 are amended for clarification purposes. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

Claims 1-5, 10-15, 20-22, 24-26, 28-31, 30, 34 and 43-55 stand rejected under 35 U.S.C. §102(b) as being anticipated by Leube (U.S. Patent No. 5,251,197); and claims 6-9, 16-19, 23, 27, 32 and 35-42 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Leube in view of Tsujioka (U.S. Patent No. 5,316,900) and further in view of Chen (U.S. Patent No. 5,488,597). Applicants respectfully traverse the rejections.

In particular, neither Leube, Tsujioka or Chen, either alone or in combination, disclose or suggest an optical recording medium, wherein at least recorded information can be reproduced from the optical recording medium so that a polarization angle of a reproducing light is at least twice that of a recording light, as recited in the independent claims 1, 11, 21, 22, 26, 35, 37, 39, 40, 43, 46, 49 and 52-55.

Specifically, Leube discloses that after birefringence was induced in a film 12 by irradiating the film 12 with light from an argon laser 14 through a shutter 24, the laser 14 was

rotated 90° degrees so that the incident light beam was linearly polarized in the direction indicated at reference number 30. See Fig. 1, and column 8, lines 15-68. Rotation of the linearly polarized light beam could likewise be accomplished by using a half-wave plate or similar device if so desired. However, when irradiated with light from the same laser whose polarization had been rotated 90° degrees, the induced birefringence along the direction indicated by arrow 22 was erased.

Tsujioka discloses in Fig. 4 that the polarizer 7 removes random-polarized spontaneous emission components from the light beam produced from the semiconductor laser 5. See column 9, lines 60-64.

Chen discloses that a polarizer 18 establishes an initial polarized condition for the light beam, and is not a polarization rotary device that rotates the polarization angle of a recording light. However, the polarizer 18 in Chen polarizes the light beam 16 so that the control layer 14 can additionally polarize the light beam 16 and direct the light beam 16 to specific recording layer 12 that is to be subject to interaction with a light beam 16.

In stark contrast to Applicants claimed invention, neither Leube, Tsujioka or Chen disclose or suggest a recording medium wherein at least the recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

Accordingly, because Leube fails to disclose each and every feature as the claimed invention, and because Tsujioka and Chen fail to provide the deficiencies in Leube, Applicants submit that claims 1-55 define patenable subject matter. Accordingly, Applicants respectfully request that the rejections under 35 U.S.C. §102(b) and 35 U.S.C. 103(a) be withdrawn.

In view of the foregoing amendments and remarks, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1 - 55 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' attorney at the telephone number listed below.

Respectfully submitted,

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JAO:RSE/ala

Attachments:
Appendix
Petition for Extension of Time

Date: April 22, 2002

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Claims:

The following is a marked-up version of the amended claims:

1. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising at least one optical recording layer, the optical recording layer including an optical recording material having at least one of a polymer or a liquid crystal polymer that changes a state of photo-induced birefringence in response to a recording light that is externally controlled from the optical recording medium to rotate a polarization angle of the recording light, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a half-wave plate; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

11. (~~Twice~~Three Times-Amended) An optical recording medium comprising:

at least one optical recording layer including an optical recording material that changes a state of photo-induced birefringence in response to a recording light that is externally controlled from the optical recording medium to rotate a polarization angle of the recording light, a portion of the recording layer that changes a state of photo-induced birefringence substantially acting optically as a quarter-wave plate; and

an optical reflection layer formed on one surface of said optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

21. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising an optical recording layer that includes a material having at least one of a polymer or a liquid crystal polymer in which an azimuth of birefringence that is induced by a recording light externally controlled from the optical recording medium to rotate a polarization angle of the recording light changes in response to a rotation of the polarization angle of said recording light; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

22. (~~Twice~~Three Times-Amended) An optical recording method comprising:

controlling a polarization angle of a recording light emitted from a light source, the recording light externally controlled from an optical recording medium to rotate the polarization angle of the recording light;

illuminating the optical recording medium with said recording light; and

forming an optical element on the optical recording medium by the illumination, that acts substantially as a half-wave plate, having an azimuth corresponding to a polarization angle on the optical recording medium,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

26. (~~Twice~~Three Times-Amended) An optical recording method comprising:

controlling a polarization angle of a recording light emitted from a light source, the recording light externally controlled from an optical recording medium to rotate the polarization angle of the recording light;

illuminating the optical recording medium with said recording light; and

forming an optical element on the optical recording medium by the illumination, that acts substantially as a quarter-wave plate, having an azimuth corresponding to a polarization angle on the optical recording medium,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

35. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising an optical recording layer including an optical recording material having at least one of a polymer or a liquid crystal polymer that stores multilevel information using a light induced birefringence that acts optically as a half-wave plate, an orientation of an azimuth of birefringence formed by a recording light representing the multilevel information, the recording light externally controlled from the optical recording medium to rotate a polarization angle of the recording light; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

37. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising an optical recording layer including an optical recording material having at least one of a polymer or a liquid crystal polymer that stores multilevel information using a light induced birefringence that acts optically as a quarter-wave plate, at orientation of an azimuth of birefringence induced by controllably rotating a polarization angle of a recording light externally from the optical recording medium that represents the multilevel information; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

39. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising an optical recording layer having at least one of a polymer or a liquid crystal polymer in which an azimuth of birefringence induced by controllably rotating a polarization angle of a recording light externally from the optical recording medium is multilevel-modulated and recorded in response to a rotation of a polarization angle of said recording light; and

a substrate which sustains the optical recording layer;

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of a reproducing light is at least twice that of the recording light.

40. (~~Twice~~Three Times-Amended) An optical reproducing method comprising:

radiating a reproducing light on an optical recording medium in which an azimuth of an optical element that acts substantially as a half-wave plate is multilevel recorded in response to a polarization angle of a recording light that is externally controlled from the optical recording medium to rotate the polarization angle of the recording light; and

determining a polarization angle of the reproducing light transmitted by said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

43. (~~Twice~~Three Times-Amended) An optical reproducing method comprising:

radiating reproducing light on an optical recording medium in which an azimuth of an optical element that acts substantially as quarter-wave plate is multilevel-

recorded in response to a polarization angle of a recording light that is externally controlled from the optical recording medium to rotate the polarization angle of the recording light; and

determining a polarization angle reproducing light reflected from said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

46. (~~Twice~~Three Times-Amended) An optical reproducing apparatus comprising:

a reproducing light optical system for transmitting reproducing light to an optical recording medium in which an azimuth of an optical element that acts substantially as a half-wave plate is multilevel recorded in response to a polarization angle of a recording light that is externally controlled from the optical recording medium to rotate the polarization angle of the recording light; and

an analyzing unit that detects a polarization angle of reproducing light transmitted by said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

49. (~~Twice~~Three Times-Amended) An optical reproducing apparatus comprising:

a reproducing light optical system for emitting reproducing light toward an optical recording medium in which an azimuth of an optical element that acts substantially as a quarter-wave plate is multilevel recorded in response to a polarization angle of a recording light that is externally controlled from the optical recording medium to rotate the polarization angle of the recording light; and

an analyzing unit that detects a polarization angle of reproducing light reflected by an optical reflection layer and transmitted by said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

52. (~~Twice~~Three Times-Amended) An optical recording and reproducing apparatus comprising:

a light source that generates a recording light;

a polarization rotary device that rotates a polarization angle of said recording light;

a focusing optical system that irradiates an optical recording medium with said recording light obtained from said polarization rotary device;

a reproducing light optical system that irradiates said optical recording medium with reproducing light; and

an analyzing unit that detects a polarization angle of reproducing light acted on by said optical recording medium,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

53. (~~Twice~~Three Times-Amended) A method for optically recording and reproducing information, comprising:

controlling a polarization angle of a recording light emitted from a light source, the recording light controlled externally from an optical recording medium to rotate the polarization angle of the recording light;

illuminating the optical recording medium with said recording light;

forming an optical element on the optical recording medium by the illumination having an azimuth corresponding to a polarization angle on the optical recording medium;

radiating reproducing light on the optical recording medium; and

determining a polarization angle of reproducing light acted on by said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

54. (~~Twice~~Three Times-Amended) A device for optically recording and reproducing information, comprising:

controlling means for controlling a polarization angle of a recording light emitted from a light source, the recording light controlled externally from an optical recording medium to rotate the polarization angle of the recording light;

forming means for forming an optical element on the optical recording medium by the illumination having an azimuth corresponding to a polarization angle on the optical recording medium;

illumination means for radiating reproducing light on the optical recording medium; and

determining means for determining a polarization angle of reproducing light acted on by said optical element,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.

55. (~~Thrice~~Four Times-Amended) An optical recording medium, comprising an optical recording layer having at least one of a polymer or a liquid crystal polymer in which an optical element is formed by a recording light that is externally controlled from the optical recording medium to rotate a polarization angle of the recording light, the optical element having an azimuth of birefringence and acting on reproducing light to adjust a polarization angle of the reproducing light by an amount greater than a difference between a polarization angle of the recording light used to form the optical element and a polarization angle of the reproducing light before the reproducing light is acted on by the optical element; and

a substrate which sustains the optical recording layer,

wherein recorded information can be reproduced from the optical recording medium so that the polarization angle of the reproducing light is at least twice that of the recording light.